Office of Fuels Development's Feedstock Development R&D

Developing new, cost-effective alternative fuel crops

ENERGY EFFICIENCY AND RENEWABLE ENERGY

OFFICE OF TRANSPORTATION TECHNOLOGIES

Transportation

FOR THE 21ST CENTURY

Ethanol, whether used alone or blended into gasoline, offers a number of benefits as a motor fuel. It is potentially cleaner than petroleum-based fuels, offering the possibility of reducing carbon dioxide and other emissions. It is a high-octane liquid fuel that can be produced domestically. It is also a biofuel made primarily from plants, and renewable, whereas the world's oil supplies are finite.

However, the widespread use of ethanol is limited by a number of factors that serve to make it more expensive than gasoline on a gallon-equivalency basis. One factor is the cost of feedstocks, which currently account for about one-third of the price of the fuel. Corn and wheat are the primary crops used in ethanol production today. Although plentiful, these crops have high value as food and animal feed, so their availability as feedstock for fuel applications is limited.

Developing low-cost feedstocks

The Office of Fuels Development's R&D to develop feedstock is aimed at reducing the cost of biomass waste and residues and developing low-cost energy crops. Biofuel and electric power producers are already considering these crops in their plans for reducing oil imports.

The focus of DOE's research is on fast-growing grasses and trees and collection of low-cost agricultural residues. Cooperating universities and U.S. Department of Agriculture research facilities have screened more than 120 different species in multi-year experiments. While many species show potential as energy crops for the near future, switchgrass, hybrid poplar, and willow trees were identified as the most promising crops. Energy crop R&D efforts to lower production costs and increase yields have succeeded in reducing costs to $3.25 per million Btus, and in increasing yields from 3 to 8 tons per acre. The goal of the R&D effort is to produce an average biomass yield of 10 tons per acre at a cost of $2.00 per million Btus.

Collecting agricultural residues cost-effectively

R&D efforts to reduce the costs of collecting agricultural residues are just beginning. These efforts involve the evaluation, development, or modification of equipment, and logistics to remove cornstalks or other crop residue at a low cost and in an environmentally sound manner.

Providing benefits to farmers

The opportunity to grow new energy crops could have significant benefits for America's farmers. Trees and grasses can provide farmers with a more diverse range of land-use alternatives, as well as help reduce erosion and retain organic matter in the soil. Because crops of trees and grasses are perennial rather than annual, soil disturbance is minimized, nutrients are recycled internally, and the land's wildlife value is improved. To reduce inputs of fertilizers and pesticides, energy crops are being developed for efficient nutrient use and resistance to pests and diseases.

Engaging in partnerships with private and public sector organizations

More than a dozen individual feedstock-development efforts are underway that include work with private sector organizations such as major corporations, academic institutions, and wildlife societies. In addition, there are joint efforts with the U.S. Department of Agriculture, and environmental and economic analyses are underway at DOE's Oak Ridge National Laboratory, which also provides field management for the effort.

A farmer harvests a field of switchgrass, which is an excellent energy crop for biofuels production. A hearty perennial, this thick-stemmed grass can grow taller than 6 feet and its roots extend more than 2.5 feet into the ground, which enables it to survive in depleted soils. It is harvested like regular hay.

Creating healthier air — and a healthier economy

A major American biofuels industry could bolster the domestic farm economy, potentially lowering the need for government subsidies. It could also create jobs not just in the agricultural arena, but in sectors including engineering, financing, vehicle manufacturing, and fuel conversion. In addition, a successful biofuels industry would significantly decrease American dependence on imported oil, bolstering our energy security and balance of trade.

For more information on how DOE is helping America remain competitive in the 21st century, please contact:

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